



Proposed Path Forward for RC1 and RC2 Rate Limitations

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RC1 CuCr Path Forward

		Steady State Rate [lb/h]	Proposed Rate Limit [lb/h]	Rate Reduction
RC1 CuCr	Cu 1800 P	400	350	13%
	Cu 1820 P	400		13%
	Cu 1885 P	650		46%
	Cu 1950 P	650		46%
	Cu 1136 P	600		42%
	Cu 0396 P	650		46%

- Permit CuCr products collectively under one rate – 350 lb / h
- Administratively control nitrate content with intermediate spec on dried powder

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Scenario 1

	Permit by Family	Products	Steady State Rate [lb/h]	Rate by Family [lb/h]	Rate Reduction
RC2 Non-Cr	NOx generating	Cu 5020 P/ FT-BYD	300	100	67%
	NOx free	Cu 3818/3819 P	375	375	0%

- Products with NOx generation will be permit limited at 100 lb/h
 - ➔ Administratively control nitrate content
- Keep copper carbonate (NOx-free) products on RC2 with current rates.
- Move Cu 0539 P to PPT or RC5.

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Scenario 2

- Move both Cu 5020 P and Cu 0539 P to RC5 (trimer)
 - The amount of nitrate testing to support both CuCr and non-Cr may be too much for the lab to handle
- Cu carbonate (NOx-free) product rates do not need to be changed

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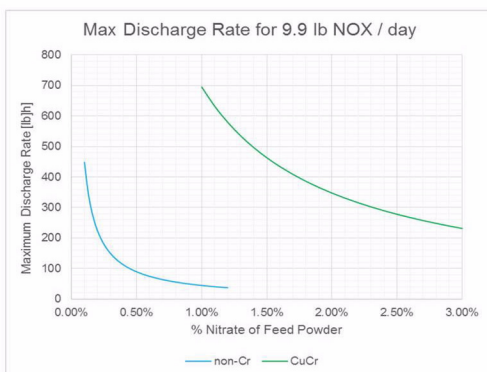
Methodology and Calculations

1. ERM and PPT reports lb NOX generated for a specific bag or tote for a product
2. The nitrate content of that bag or tote is also measured by Elyria QC
3. A NO₃ -> NOX conversion rate is calculated from these values
 - a. 93% for non-Cr
 - b. 6% for CuCr
4. The average nitrate content for each product is obtained by measuring multiple samples (average is sometimes higher, sometimes lower than the specific ERM/PPT measured bag)
5. This average nitrate content is then used to calculate an average NOX generation based on the reported NO₃ -> NOX conversion rate from ERM/PPT
6. Product rates are calculated based on a target NOX generation of 9.9 lb NOX / day

$$Max. Discharge Rate = \frac{9.9 \text{ lb NO}_x / \text{day} * (1 - \%LOI_{@cal.temp})}{\%NO_3 * conversion * \frac{46 \text{ g NO}_x / \text{mol NO}_x}{62 \text{ g NO}_3 / \text{mol NO}_3}}$$

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Discharge Rate vs. Nitrate Content



*Values are based on CuCr w/ 6% conversion, 25% LOI, and 2.00% NO₃ unless otherwise noted

- At a given limit for NOX generation, discharge rate is determined solely by nitrate content
- A target of 9.9 vs. 9.0 lb / day increases rate by ~10%

Target NOX [lb / day]	Maximum Discharge rate [lb / h]
9.0	327
9.1	330
9.2	334
9.3	338
9.4	341
9.5	345
9.6	349
9.7	352
9.8	356
9.9	359

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Stack Testing Results

Product	Composition	NO _x Generation [lb/day]	Measurement by
Cu 0539 P	Cu/Al	11	ERM
Cu 1800 P	CuCr	16	ERM
Cu 1820 P	CuCr	9	ERM
Cu 5020 P	Cu/Si	12	PPT
Cu 6081 P	Cu/Si	48	PPT

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